AP Statistics Practice Test (page 342)

T5.1 e. Probability only tells us what happens approximately in the long run, not what will happen in the short run or exactly in the long run.

T5.2 d. You need exactly 62 of the 100 2-digit numbers to represent the event "having heard of Coca-cola."

T5.3 c. Add the probabilities for 3, 4 and 5 cars.

T5.4 b. All 2-digit numbers among the first 10 are between 00 and 97 except 98.

T5.5 b. 255 of the 1000 students had a GPA below 2.0.

T5.6 c. There are 285 students who either have a GPA below 2.0, have skipped many classes or both.

T5.7 e. There are 110 students who have skipped many classes. 80 of them have a GPA below 2.0.

T5.8 e. If A and B are independent, then we don't know whether B has occurred if A occurred. But if A and B are mutually exclusive and B has occurred, then we know that A couldn't have occurred.

T5.9 b.

$$P(\text{woman} \cup \text{never married}) = P(\text{woman}) + P(\text{never married}) - P(\text{woman} \cap \text{never married}).$$

T5.10 c. We want

$$P(\text{first is face card} \cap \text{second is face card} \cap \text{third is face card}) = \left(\frac{12}{52}\right)\left(\frac{11}{51}\right)\left(\frac{10}{50}\right) \approx 0.01.$$

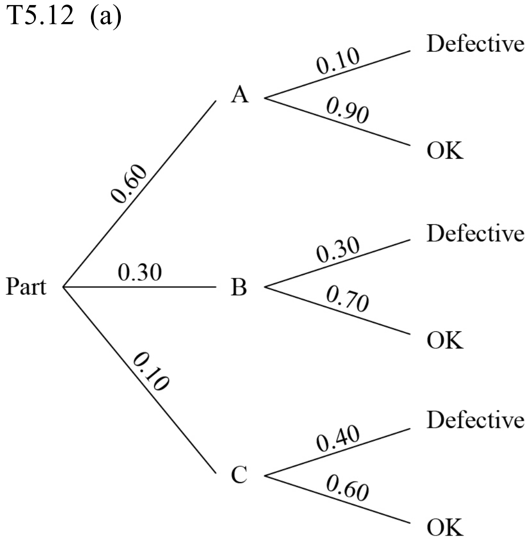
T5.11 (a) Here is a completed table, with T indicating the teacher wins and *Y* indicating that you win.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	-	T	T	T	T	T	T	T
2	Y	-	T	T	T	T	T	T
3	Y	Y	-	T	T	T	T	T
4	Y	Y	Y	-	T	T	T	T
5	Y	Y	Y	Y	-	T	T	T
6	Y	Y	Y	Y	Y	-	T	T

Because each outcome is equally likely and there are 48 outcomes, each outcome has probability $\frac{1}{48}$. There are 27 ways in which the teacher wins, So the probability that the teacher wins is $\frac{27}{48} = 0.5625$.

(b) We use the fact that $P(A\cup B)=P(A)+P(B)-P(A\cap B)$. From part (a), $P(A)=\frac{27}{48}$.
There are 8 outcomes in which you get a 3 so $P(B)=\frac{8}{48}$ and there are 5 outcomes in which you roll a 3 and the teacher still wins so $P(A\cap B)=\frac{5}{48}$. Putting all of this together gives
$P(A\cup B)=\frac{27}{48}+\frac{8}{48}-\frac{5}{48}=\frac{30}{48}=\frac{5}{8}$.
(c) $P(A)=\frac{27}{48}=0.5625$, but $P(A \mid B)=\frac{5}{8}=0.625$. Because these probabilities are not the same, A and B are not independent. Knowing that you rolled a 3 makes it more likely that the teacher wins.

T5.12 (a)



(b) To get the probability that a part randomly chosen from all parts produced by this machine is defective, add the probabilities from all branches in the tree that end in a defective part.
$P(\text{defective}) = (0.60)(0.10) + (0.30)(0.30) + (0.10)(0.40) = 0.06 + 0.09 + 0.04 = 0.19$.
(c) First compute the conditional probabilities that the part was produced on a particular machine given that it is defective. $P(\text{A}\mid\text{defective})=\frac{0.06}{0.19}=0.3158$. $P(\text{B}\mid\text{defective})=\frac{0.09}{0.19}=0.4737$.
$P(\text{C}\mid\text{defective})=\frac{0.04}{0.19}=0.2105$. Because the largest of these three conditional probabilities is for machine B, the defective part is most likely to have come from machine B.

T5.13 (a) Here is a two-way table that summarizes this information:

	Smokes	**Does not smoke**	**Total**
Cancer	0.08	0.04	**0.12**
No cancer	0.17	0.71	**0.88**
Total	**0.25**	**0.75**	**1.00**

$P(\text{gets cancer} \mid \text{smoker}) = \dfrac{P(\text{gets cancer} \cap \text{smoker})}{P(\text{smoker})} = \dfrac{0.08}{0.25} = 0.32.$ There is a 0.32 probability that an individual gets cancer given that he is a smoker.

(b) $P(\text{smokes} \cup \text{gets cancer}) = P(\text{smokes}) + P(\text{gets cancer}) - P(\text{smokes} \cap \text{gets cancer})$ = 0.25 + 0.12 – 0.08 = 0.29. Alternatively,

$P(\text{smokes} \cup \text{gets cancer}) = 1 - P(\text{does not smoke} \cap \text{does not get cancer}) = 1 - 0.71 = 0.29.$

(c) From the two-way table, $P(\text{cancer}) = 0.12$. Thus,

$P(\text{at least one gets cancer}) = 1 - P(\text{neither gets cancer}) = 1 - 0.88^2 = 0.2256.$ There is a 0.2256 probability that at least one of the two gets cancer.

T5.14 (a) Assign the numbers 00–16 to represent cars with out-of-state plates and 17–99 to represent other cars. Start reading 2-digit numbers from a random number table until you have found two numbers between 00 and 16 (repeats are allowed). Record how many 2-digit numbers you had to read in order to get 2 numbers between 00 and 16. Repeat many times for the simulation.

(b) The first sample is 41 **05 09**. The numbers in bold represent cars with out-of-state plates. In this sample it took three cars to find two with out-of-state plates. The second sample is 20 31 **06** 44 90 50 59 59 88 43 18 80 53 **11**. In this sample it took 14 cars to find two with out-of-state plates. The third sample is 58 44 69 94 86 85 79 67 **05** 81 18 45 **14**. In this sample it took 13 cars to find two with out-of-state plates.